



PATENT ABSTRACTS OF JAPAN

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KAINUMA KOJI**(54) **FIBER-REINFORCED PLASTIC PANEL, ITS JOINT BODY, AND INCOMBUSTIBLE, COMPOSITE, FIBER-REINFORCED PLASTIC PANEL**

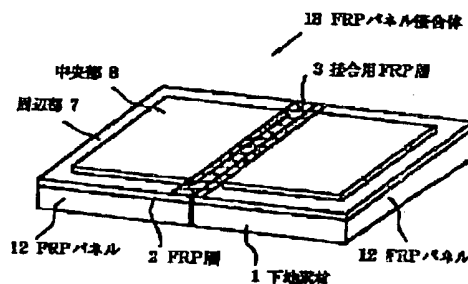
strength can be enhanced, and the manufacturing work can be executed, ranging over a wide area and without difficulty.

(57) Abstract:

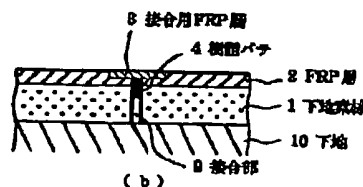
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PURPOSE: To enhance workability by forming a fiber-reinforced plastic layer, in which either the periphery is lower than the central part by a certain step or there is no step between the two, on an inclined bed material consisting of a hard, foam plastic board or the like.

CONSTITUTION: In manufacturing an FRP panel joint body 13, a plurality of FRP panels 12, in which a peripheral part 7 of an FRP layer 2 is lower than a central part 8 by a certain step, are fixed on a designated surface in such a manner that the inclination of respective panels follows the same direction. Next, a joint part 9 is filled with resin putty 4, while unhardened resin is applied to the peripheral part 7, laminating it together with reinforcing fibers. By hardening the resin, an FRP layer 3 for joining is formed. After this, an incombustible layer such as concrete and a plasterboard is formed on the FRP layer 2 via the adhesive or the like. With this contrivance, both works for forming a bed with inclination and works for forming the FRP layer on the bed can be executed by a single work-contractor at the same time. In addition, heat insulating performance, water proofing property, damp proofing property, fire resistance, and mechanical



(a)



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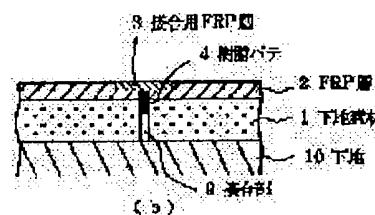
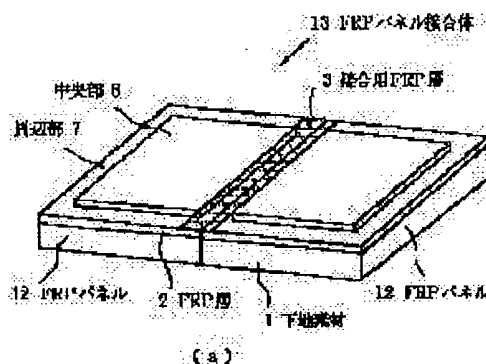
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(54) FIBER-REINFORCED PLASTIC PANEL, ITS JOINT BODY, AND INCOMBUSTIBLE, COMPOSITE, FIBER-REINFORCED PLASTIC PANEL

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PURPOSE: To enhance workability by forming a fiber-reinforced plastic layer, in which either the periphery is lower then the central part by a certain step or there is no step between the two, on an inclined bed material consisting of a hard, foam plastic board or the like.

CONSTITUTION: In manufacturing an FRP panel joint body 13, a plurality of FRP panels 12, in which a peripheral part 7 of an FRP layer 2 is lower than a central part 8 by a certain step, are fixed on a designated surface in such a manner that the inclination of respective panels follows the same direction. Next, a joint part 9 is filled with resin putty 4, while unhardened resin is applied to the peripheral part 7, laminating it together with reinforcing fibers. By hardening the resin, an FRP layer 3 for joining is formed. After this, an incombustible layer such as concrete and a plasterboard is formed on the FRP layer 2 via the adhesive or the like. With this contrivance, both works for forming a bed with inclination and works for forming the FRP layer on the bed can be executed by a single work-contractor at the same time. In addition, heat insulating performance, water proofing property, damp proofing property, fire resistance, and mechanical strength can be enhanced, and the manufacturing work can be executed, ranging



over a wide area and without difficulty.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] Especially this invention relates to the bicomponent fiber reinforced plastics panel which established inclination about a fiber-reinforced-plastics panel, its zygote, and a nonflammable bicomponent fiber reinforced plastics panel the not making liquids, such as water, pile up in the flat-surface section the outdoors, such as a veranda, a balcony, a flat roof, and a floor line, and indoor object, and formed the incombustible material in the fiber-reinforced-plastics panel with inclination which was made to form a direct fiber-reinforced-plastics layer in the top face through other ingredients, and was made to unite with it, its zygote, it, etc.

[0002]

[Description of the Prior Art] In order to construct water proof finishing conventionally in the flat-surface section the outdoors, such as a veranda, a balcony, a flat roof, and a floor line, and indoor In order to make the substrate flat-surface section which has inclination first, the first work person Timber and concrete, such as a plywood, After it constructs using mortar etc. and a substrate flat surface constructs, work which forms a fiber-reinforced-plastics layer as a layer (it is a water-resistant layer if it is in water) for the second work person to prevent trespass of a liquid is performed.

[0003]

[Problem(s) to be Solved by the Invention] However, in making the substrate which has the inclination using the conventional timber, concrete, mortar, etc., not only **** but a certain amount of special skill is needed for an effort. Moreover, since concrete, mortar, etc. will need a predetermined curing period by the time it hardens them thorough, they have the fault to which a construction period becomes long.

[0004] Furthermore, since the work person of making a substrate who has inclination, and the work person who constructs a fiber-reinforced-plastics layer on the top face of the substrate are separate respectively, there are complicatedness of order and trouble of production control and the time loss by the inconsistency of communication has also been generated.

[0005] Furthermore, if it is in the case of the outdoors, such as a veranda, a balcony, and a flat roof, when the substrate of once having the inclination of concrete, mortar, etc. with storm sewage has got wet, being unable to perform the following waterproofing work but leading to the delay of a construction period has occurred frequently until it gets dry thoroughly.

[0006] This invention is made in view of such a conventional trouble, and when a single work person enables it to perform simultaneously making the substrate which has inclination, and work which forms an FRP layer in the top face, it tends to cancel the delay of the construction period by various time losses and weathers, the lack of skill, etc.

[0007] Moreover, this invention tends to offer the fiber-reinforced-plastics panel with inclination which has heat insulation and water proof, and a moisture-proof function, and was excellent in watertightness or a mechanical strength. Moreover, this invention tends to offer the zygote of the fiber-reinforced-plastics panel which joins two or more above-mentioned fiber-reinforced-plastics panels with

inclination, and has the heat insulation and water proof which can be enforced in a large area, and a moisture-proof function, and was excellent in watertightness or a mechanical strength.

[0008] Furthermore, this invention tends to offer the nonflammable bicomponent fiber reinforced plastics panel which is incombustibility and has heat insulation and water proof, and a moisture-proof function by forming an incombustible-material layer on the fiber-reinforced-plastics layer of the above-mentioned fiber-reinforced-plastics panel with inclination. Moreover, this invention tends to add energy-saving nature and an indoor dew condensation prevention function by using a heat insulator for a substrate raw material.

[0009]

[Means for Solving the Problem] That is, it is the fiber-reinforced-plastics panel characterized by this invention making a fiber-reinforced-plastics layer form on a substrate raw material with inclination, and coming to unify it.

[0010] Moreover, this invention is the manufacture approach of the fiber-reinforced-plastics panel which applies non-hardened resin on a substrate raw material with inclination, carries out a laminating with the fiber for a consolidation, and is characterized by stiffening resin and forming a fiber-reinforced-plastics layer.

[0011] It is the fiber-reinforced-plastics panel characterized by a periphery making the fiber-reinforced-plastics layer which has a level difference lower than a center section form on a substrate raw material with inclination, and coming to unify this invention.

[0012] Moreover, this invention is the manufacture approach of the fiber-reinforced-plastics panel which applies non-hardened resin to the whole surface of a substrate raw material with inclination, carries out a laminating with the fiber for a consolidation, subsequently applies non-hardened resin to a center section, carries out a laminating with the fiber for a consolidation, and is characterized by forming the fiber-reinforced-plastics layer in which resin is stiffened and a periphery has a level difference lower than a center section.

[0013] It is the fiber-reinforced-plastics panel zygote characterized by this invention arranging the fiber-reinforced-plastics panel with two or more same inclination by which a periphery has a level difference lower than a center section in the above-mentioned fiber-reinforced-plastics layer so that inclination may serve as the same direction, and it making a fiber-reinforced-plastics layer form in a periphery lower than the center section of the panel formed in the joint of the adjoining panel comrade, and coming to join it.

[0014] Moreover, as for this invention, a periphery has a level difference lower than a center section in the above-mentioned fiber-reinforced-plastics layer. A fiber-reinforced-plastics panel with two or more same inclination is arranged so that inclination may serve as the same direction. To a periphery lower than the center section of the panel formed in the joint of the adjoining panel comrade It is the manufacture approach of the fiber-reinforced-plastics panel zygote which applies non-hardened resin, carries out a laminating with the fiber for a consolidation, and is characterized by stiffening resin, making a fiber-reinforced-plastics layer form, and joining a panel comrade.

[0015] It is the nonflammable bicomponent fiber reinforced plastics panel characterized by this invention making a fiber-reinforced-plastics layer form on a substrate raw material with inclination, and coming to form an incombustible-material layer on this fiber-reinforced-plastics layer.

[0016] Hereafter, this invention is explained to a detail. Drawing 1 is the explanatory view showing an example of the fiber-reinforced-plastics (it is hereafter described as FRP) panel of this invention, drawing 1 (a) is a perspective view and drawing 1 (b) is AA line sectional view. In this drawing, the FRP panel 11 of this invention is the FRP panel which makes it come to unify a hard foamed-plastics plate and an FRP layer, without making the resin for direct FRP apply and harden, forming the FRP layer 2, and minding adhesives etc. on the substrate raw material 1 with inclination.

[0017] In this invention, it is desirable to use a hard foamed-plastics plate for the substrate raw material 1 with inclination. Although there is especially no limit and it can be used for a hard foamed-plastics plate if it is plastics which has adiathermic [to which it foamed by hard], urethane foam, chlorination vinyl foam, acrylic form, styrene-polyethylene graft mixing form, phenol form, a carbonized cork, a

form dog lath, etc. are mentioned, for example, and urethane foam, chlorination vinyl foam, acrylic form, and phenol form are desirable especially in them.

[0018] In order to improve water proof of an enforcement side, the plate to which thickness was continuously changed so that fixed inclination might be attached to the whole surface at least is used for a hard foamed-plastics plate. Moreover, energy-saving nature and an indoor dew condensation prevention function are obtained by using heat insulators, such as a hard foamed-plastics plate, for a substrate raw material.

[0019] The FRP layer formed on a hard foamed-plastics plate can give various properties, such as water proof, moisture proof, reinforcement, and flexibility, chemical resistance, by changing construction material according to an application, combining the class of fiber, the amount of resin and fiber, and resin suitably, although the resin layer strengthened with fiber is used.

[0020] As fiber, organic fiber, such as a glass fiber and polyester fiber, etc. is mentioned, for example. Moreover, as resin for FRP, an unsaturated polyester resin, vinyl ester resin, an epoxy resin, phenol resin, etc. are mentioned, for example.

[0021] However, since the styrene monomer is mixed in the resin for FRP generally used and it dissolves when a substrate raw material with inclination is polystyrene system form, to use polystyrene system form, it is necessary to use special resin, such as an unsaturated polyester resin which does not contain a styrene monomer.

[0022] Moreover, the manufacture approach of the FRP panel 11 of this invention applies non-hardened resin on the substrate raw materials 1, such as a hard foamed-plastics plate with inclination, it carries out a laminating with the fiber for a consolidation, it stiffens resin, and forms the FRP layer 2.

[0023] The concrete approach of forming an FRP layer on a hard foamed-plastics plate applies resin, such as a direct unsaturated polyester resin, on the hard foamed-plastics plate which has fixed inclination on the whole surface, subsequently covers with the mat of a glass fiber promptly, further, carries out optimum dose spreading, carries out impregnation of the resin, such as an unsaturated polyester resin, removes and leaves air bubbles with a degassing roller after that, and stiffens resin. Then, the resin for topcoats may be applied and stiffened if needed, and a topcoat resin layer may be prepared. An unsaturated polyester resin, vinyl ester resin, an epoxy resin, etc. are used for the resin for topcoats.

[0024] The FRP panel with inclination of above-mentioned this invention has heat insulation and water proof, and a moisture-proof function, and is excellent in watertightness or a mechanical strength.

[0025] Next, drawing 2 is the explanatory view showing other examples of the FRP panel of this invention, drawing 2 (a) is a perspective view and drawing 2 (b) is BB line sectional view. In this drawing, the FRP panel 12 of this invention is the FRP panel which make form the FRP layer 2 in which a periphery 7 has a level difference lower than a center section 8 on the substrate raw material 1 with inclination, and it comes to unify.

[0026] Moreover, the manufacture approach of the FRP panel 12 of this invention Apply non-hardened resin, and with the fiber for a consolidation, carry out a laminating to the whole surface of the substrate raw materials 1, such as a hard foamed-plastics plate with inclination, and FRP layer 2a is formed in it. Subsequently, non-hardened resin is applied to a center section 8, a laminating is carried out with the fiber for a consolidation, FRP layer 2b is formed, and the FRP layer in which resin is stiffened and a periphery 7 has a level difference lower than a center section 8 is formed.

[0027] Since it has the above structures, in a construction site, processing of easy cutting etc. can do the FRP panel of this invention. And it has the advantage which can make the substrate which had inclination without needing special skill. in addition -- It can carry out whether it arranges, after processing the hard foamed plastics generally used as a heat insulator into the configuration which had inclination beforehand, arranging this thing to a construction side, and forming an FRP layer or making an FRP layer form on a substrate raw material, and work of the object can be made to complete.

[0028] In the outdoors or indoor flat-surface section, the method of making the required FRP panel form to a construction side carries out adhesion immobilization through glue lines, such as adhesives and adhesive tape, or with a nail etc., it fixes mechanically and it arranges only the substrate raw material with inclination first used for this invention. The FRP panel with inclination which applied direct non-

hardened resin to the top face of the arranged substrate raw material with inclination, carried out the laminating to it with the fiber for a consolidation, set fixed time amount on it, it was made to harden thoroughly, and was united with it is obtained.

[0029] That a substrate raw material and FRP layers, such as a hard foamed-plastics plate, can be unified without using adhesives although the FRP panel of this invention is not using adhesives Since the hard foamed-plastics plate has closed cell structure and the front face is presenting the shape of fine irregularity In order to apply the liquefied resin for FRP there, to enter and to harden, the touch area is because there is an advantage which also commits an anchor effect and is useful to improvement in bond strength while becoming very large. Although this can be said also when liquefied adhesives are applied to a hard foamed-plastics plate, it is necessary to form an FRP layer on an adhesives layer in this case, and will paste up at the flat surface where this FRP layer and an adhesives layer are simple, and an anchor effect is not acquired. Moreover, if adhesives are used, it is necessary to create only an FRP layer independently, and the process of applying adhesives not only increases, but will become a very troublesome activity.

[0030] The FRP panel with inclination of above-mentioned this invention has heat insulation and water proof, and a moisture-proof function, and is excellent in watertightness or a mechanical strength.

[0031] Next, drawing 3 is the explanatory view showing an example of the FRP panel zygote of this invention, drawing 3 (a) is a perspective view and drawing 3 (b) is a fragmentary sectional view. In this drawing the FRP panel zygote 13 of this invention It is the thing which comes to join the FRP panel 12 by which a periphery 7 has a level difference lower than a center section 8 to the FRP layer 2 shown in drawing 2. The FRP panel 12 with two or more same inclination is arranged so that inclination may serve as the same direction. Fill up the joint 9 formed among the adjoining panel comrades with the resin putty 4, the FRP layer 3 for junction is made to form in the periphery 7 which has a level difference lower than the center section 8 of the panel formed in this joint 9, and it comes to join a panel.

[0032] Although it differs, the same or by using a panel with the same inclination, it can join so that inclination may serve as the same direction, and equalization of a result condition is attained, and quality is stabilized [two or more FRP panels to join] by the cross-section configuration.

[0033] Moreover, the manufacture approach of the FRP panel zygote 13 of this invention A periphery 7 has a level difference lower than a center section 8 in the FRP layer 2 shown in drawing 2. Fix to an activity side and the FRP panel 12 with two or more same inclination is arranged so that inclination may serve as the same direction. The joint 9 of the adjoining panel comrade is filled up with the resin putty 4, apply non-hardened resin to the periphery 7 which has a level difference lower than the center section 8 of the panel formed in this joint 9, carry out a laminating to it with the fiber for a consolidation, make it harden resin, the FRP layer 3 for junction is made to form in it, and a panel comrade is joined to it.

[0034] As mentioned above, the FRP panel with inclination of this invention is enforced to a construction side, as an approach of making an FRP panel zygote with inclination form, spreading and the laminating, and the FRP panel that is made to harden and is shown in drawing 2 are beforehand produced for the FRP layer for the substrate raw material with inclination, this thing is placed in a fixed position by said approach in a construction site, and the joint between each FRP panel is joined. As the junction approach between each FRP panel, spreading, the laminating, and hardening of an FRP layer are newly done with constant width along with a knot.

[0035] The FRP panel zygote with inclination of this invention has heat insulation and water proof, and a moisture-proof function, and is excellent in watertightness or a mechanical strength while it can join two or more FRP panels with inclination as mentioned above and can enforce them in a large area.

[0036] Next, drawing 4 is the explanatory view showing an example of the nonflammable compound FRP panel 14 of this invention, drawing 4 (a) is a perspective view and drawing 4 (b) is CC line sectional view. In this drawing, the nonflammable compound FRP panel 14 of this invention makes the FRP layer 2 form on the substrate raw material 1 with inclination, and comes to form the incombustible-material layer 5 on this FRP layer 2 through adhesives or a binder 6.

[0037] As an incombustible material used for the incombustible-material layer 5, although plates, such

as concrete, brick, glass, a rock, a metal, a cemented excelsior board, plaster board, and a calcium silicate plate, are mentioned, for example, a concrete slab is desirable especially in them.

[0038] Although the pressure sensitive adhesive double coated tapes by epoxy resin adhesive, acrylic resin system adhesives, ethylene and vinyl acetate system adhesives, synthetic-rubber system adhesives, and the rubber system binder are mentioned on the FRP layer 2 as the adhesives which fix the incombustible-material layer 5, or a binder 6, for example, the pressure sensitive adhesive double coated tapes by the rubber system binder are desirable especially in them.

[0039] By preparing an incombustible-material layer on the FRP layer of an FRP panel with inclination as mentioned above, the nonflammable compound FRP panel of this invention is incombustibility, and has heat insulation and water proof, and a moisture-proof function.

[0040]

[Example] An example is given to below and this invention is concretely explained to it.

[0041] As shown in example 1 drawing 1, it is a direct unsaturated polyester resin on a rigid-urethane-foam plate with inclination (1/100) as a substrate raw material 1 Coverage 600 g/m² It applies to a prospect and subsequently covers with the mat (#450 chopped strand mat) of a glass fiber promptly, and further, optimum dose spreading is carried out and impregnation of the unsaturated polyester resin is carried out. Then, it is left until a degassing roller removes air bubbles and resin hardens, and the FRP layer 2 is formed. Then, the resin for topcoats of an unsaturated polyester resin is applied and stiffened, and the FRP panel is obtained.

[0042] Thus, the obtained FRP panel is excellent in heat insulation, water proof, and moisture proof, and has surface reinforcement and is excellent in mechanical reinforcement and endurance.

[0043] In the structural drawing 2 of an FRP panel with an example 21. level difference, the length of one side has [the degree of inclination / the FRP layer 2] the panel structure formed directly by 10/910 on the top face of rigid urethane foam (substrate raw material 1) with 40mm [in 910mm and thickness of the water bottom h], and a thickness [of the water upside H] of 50mm. FRP layers differ in the thickness of a center section 8 and a periphery 7, it has a center section 8 to about 3mm, and the periphery 7 has about 1.5mm and a level difference. The periphery of this thin FRP layer is formed over the perimeter enclosure of a panel by width of face of about 50mm.

[0044] 2. It is the unsaturated polyester resin for the hand lay up which prepared the rigid urethane foam (consistency 0.03 g/cm³) of the configuration of the manufacture approach above of an FRP panel with a level difference (40-50mm in thickness with vertical 910x width 910x inclination), and mixed the curing agent (for example, methyl ethyl ketone peroxide) of the specified quantity first on this top face Coverage 600 g/m² It applies to a prospect with a wool yarn roller on the whole surface.

[0045] Subsequently, it covers with the mat (#450 chopped strand mat) of a glass fiber with a magnitude of 910x910mm promptly, and is coverage 900 g/m² from the top further. An unsaturated polyester resin is applied to a prospect and impregnation of the resin is carried out to the mat of a glass fiber. Then, once coverage 900 g/m² which covers the center section of the panel with the mat of a further 810x810mm glass fiber, and will be involved this top Impregnation of the unsaturated polyester resin is applied and carried out to a prospect. Subsequently, pushing a degassing roller, the air bubbles mixed in inside are removed and an activity is ended. Fixed time amount (about 1 hour) neglect is then carried out, resin is stiffened, and the FRP panel with a level difference which rigid urethane foam with inclination and an FRP layer unified is obtained.

[0046] In the structural drawing 3 of an example 31.FRP panel zygote, the FRP panel zygote of this example is a zygote which put in order two or more panels produced by the approach of an example 2 so that the FRP layer 2 might be used as a top face and the direction of inclination might become fixed, was made to form the new FRP layer 3 for junction only in the top face of the thin periphery 7 of an FRP layer along with a joint 9, and was connected. Under the present circumstances, the thickness of the FRP layer of the joined part and the other part is set to 3 almost samemm.

[0047] 2. Arrange two or more panels produced by the approach of the manufacture approach example 2 of an FRP panel zygote, apply to common the resin putty⁴ (unsaturated polyester resin: talc =4:6) which mixed the curing agent, and make them harden it along with a panel comrade's junction line,

using a spatula in order to fill the clearance produced with the object of reinforcement.

[0048] Next, since the film of the periphery of FRP is made of about 100mm width of face, a joint is coverage 600 g/m² only to this part. An unsaturated polyester resin is applied to a prospect with a wool yarn roller, the mat (#450 chopped strand mat) of a glass fiber is stuck promptly, and it is coverage 600 g/m² further from it. An unsaturated polyester resin is applied to a prospect and impregnation is carried out to the mat of a glass fiber. Then, the air bubbles mixed with the degassing roller are removed, and an activity is ended. Fixed time amount neglect is carried out, resin is stiffened, and an FRP panel zygote is obtained.

[0049] In the structural drawing 4 of an example 41. nonflammable compound FRP panel, the nonflammable compound FRP panel of this example is an incombustible-material composite panel which made the concrete block plate (incombustible-material layer 5) paste up on the top face of the FRP layer 2 of the panel beforehand made by examples 1, 2, and 3 through a rubber system pressure-sensitive-adhesive-doudle-coated-tape layer (binder 6).

[0050] 2. Beforehand, the FRP panel is arranged and joined, and compound-izing with the manufacture approach incombustible material of a nonflammable compound FRP panel makes the continuous FRP layer to need form in a construction side, and is carried out to it the back. A rubber system pressure sensitive adhesive doudle coated tape (binder 6) with a width of face of 100mm is stuck on the top face of the FRP layer 2 of a panel at intervals of 303mm. It pushes and sticks from the top so that the edge of concrete block plates may come to the core of adhesive tape, and it covers so that there may be no clearance in the whole. About 1-2mm in thickness and the configuration of a concrete block of a rubber system pressure sensitive adhesive doudle coated tape are 303x303x25mm.

[0051] In the above-mentioned example, generally, since processing of a light weight, cutting, etc. is easy, the hard foamed plastics used as an inclination substrate raw material of this invention do not need special skill and an experience, and it does not need tools, such as an electric saw,, either. So, construction in a short time is very possible. However, in case the FRP panel with an FRP layer which carried out unitization is cut, the activity of a power tool is desirable.

[0052] Moreover, in order that the FRP panel of this invention, its zygote, and a nonflammable compound FRP panel may make a substrate to waterproofing work and coincidence, they do not need to worry about the leakage by storm sewage, and the delay of a construction period does not generate them. Furthermore, if the FRP panel of this invention and its zygote are used, since a part of activity for forming the FRP laminating section will be mitigated, working hours are not only shortened, but the quality of finished goods is stabilized more.

[0053] Moreover, since the load per unit area is reduced compared with making a substrate using the conventional plywood, mortar, etc., the mechanical design to the load of a building becomes easy. Moreover, in order for the waterproofing work person himself to perform making a substrate, what had to place an order for making a substrate and waterproofing work with the separate contractor till then is simplified, and it is effective for shortening of a construction period.

[0054] Furthermore, if the junction approach like this invention is used, since a result side will become smooth, generating of unevenness to which an appearance is not only good, but bars the flow of a liquid selectively is mitigated. since [moreover,] the substrate raw material with inclination has heat insulation property -- the energy-saving nature of a building -- rising -- in addition -- and it is effective also in indoor dew condensation prevention. By preparing an incombustible-material layer on an FRP layer, the nonflammable compound FRP panel of this invention is incombustibility, and has heat insulation and water proof, and a moisture-proof function.

[0055]

[Effect of the Invention] Since this invention is constituted as explained above, it has the following effectiveness. Since a single work person can perform simultaneously making the substrate which has inclination, and work which forms an FRP layer in the top face, this invention can cancel the delay of the construction period by various time losses and weathers, the lack of skill, etc.

[0056] The FRP panel with inclination of this invention has heat insulation and water proof, and a moisture-proof function, and is excellent in watertightness or a mechanical strength. The zygote of the

FRP panel of this invention can join two or more above-mentioned FRP panels with inclination, and can enforce them in a large area, has heat insulation and water proof, and a moisture-proof function, and is excellent in watertightness or a mechanical strength.

[0057] Furthermore, by forming an incombustible-material layer on the FRP layer of the above-mentioned FRP panel with inclination, the nonflammable compound FRP panel of this invention is incombustibility, and has heat insulation and water proof, and a moisture-proof function. Moreover, this invention can add energy-saving nature and an indoor dew condensation prevention function by using a heat insulator for a substrate raw material.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the explanatory view showing an example of the FRP panel of this invention.

[Drawing 2] It is the explanatory view showing other examples of the FRP panel of this invention.

[Drawing 3] It is the explanatory view showing an example of the FRP panel zygote of this invention.

[Drawing 4] It is the explanatory view showing an example of the nonflammable compound FRP panel of this invention.

[Description of Notations]

- 1 Substrate Raw Material
- 2 FRP Layer
- 3 FRP Layer for Junction
- 4 Resin Putty
- 5 Incombustible-Material Layer
- 6 Adhesives or Binder
- 7 Periphery
- 8 Center Section
- 9 Joint
- 11 The FRP Panel
- 12 The FRP Panel
- 13 FRP Panel Zygote
- 14 Nonflammable Compound FRP Panel

[Translation done.]

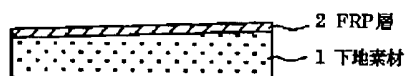
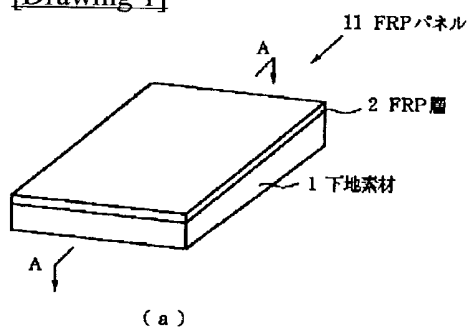
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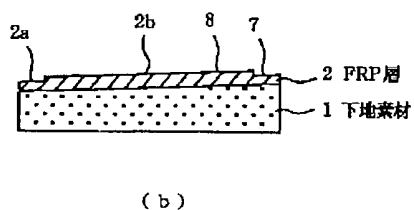
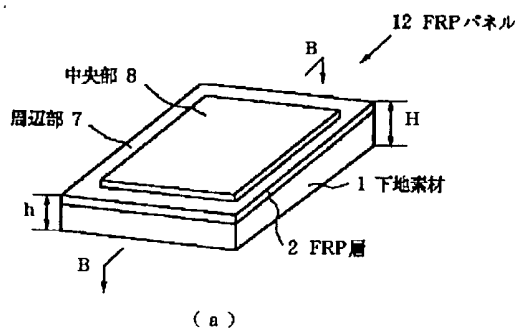
DRAWINGS

[Drawing 1]

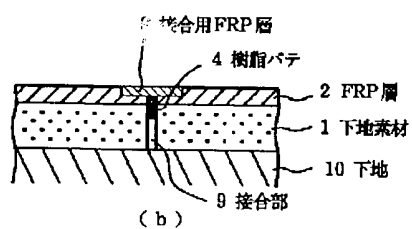
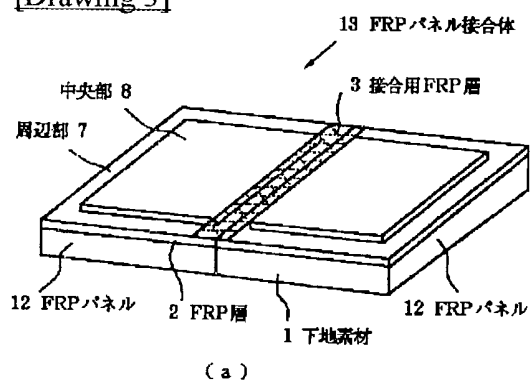


(b)

[Drawing 2]



[Drawing 3]



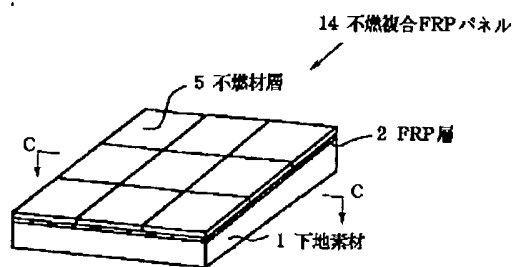
[Drawing 4]

h

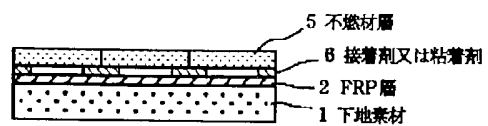
g

cg b

eb cg e e



(a)



(b)

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] The fiber-reinforced-plastics panel characterized by making a fiber-reinforced-plastics layer form on a substrate raw material with inclination, and coming to unify.

[Claim 2] The fiber-reinforced-plastics panel according to claim 1 said whose substrate raw material is a hard foamed-plastics plate.

[Claim 3] The manufacture approach of the fiber-reinforced-plastics panel which applies non-hardened resin on a substrate raw material with inclination, carries out a laminating with the fiber for a consolidation, and is characterized by stiffening resin and forming a fiber-reinforced-plastics layer.

[Claim 4] The fiber-reinforced-plastics panel characterized by making the fiber-reinforced-plastics layer in which a periphery has a level difference lower than a center section form on a substrate raw material with inclination, and coming to unify.

[Claim 5] The fiber-reinforced-plastics panel according to claim 4 said whose substrate raw material is a hard foamed-plastics plate.

[Claim 6] The manufacture approach of the fiber-reinforced-plastics panel which applies non-hardened resin to the whole surface of a substrate raw material with inclination, carries out a laminating with the fiber for a consolidation, subsequently applies non-hardened resin to a center section, carries out a laminating with the fiber for a consolidation, and is characterized by forming the fiber-reinforced-plastics layer in which resin is stiffened and a periphery has a level difference lower than a center section.

[Claim 7] The fiber-reinforced-plastics panel characterized by arranging a fiber-reinforced-plastics panel with two or more same inclination according to claim 4 so that inclination may serve as the same direction, making a fiber-reinforced-plastics layer form in a periphery lower than the center section of the panel formed in the joint of the adjoining panel comrade, and coming to join.

[Claim 8] The manufacture approach of the fiber-reinforced-plastics panel characterized by arranging a fiber-reinforced-plastics panel with two or more same inclination according to claim 4 so that inclination may serve as the same direction, applying non-hardened resin to a periphery lower than the center section of the panel formed in the joint of the adjoining panel comrade, carrying out a laminating with the fiber for a consolidation, stiffening resin, making a fiber-reinforced-plastics layer form, and joining a panel comrade.

[Claim 9] The nonflammable bicomponent fiber reinforced plastics panel characterized by making a fiber-reinforced-plastics layer form on a substrate raw material with inclination, and coming to form an incombustible-material layer on this fiber-reinforced-plastics layer.

[Claim 10] The fiber-reinforced-plastics panel according to claim 9 said whose substrate raw material is a hard foamed-plastics plate.

[Translation done.]